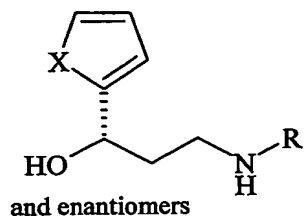


Claims

1. Process for the preparation of chiral compounds of formula

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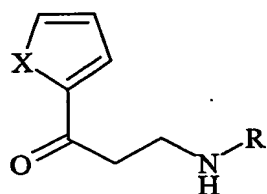
and enantiomers

wherein X represents S or O, and R represents C₁₋₆-alkyl, C₃₋₈-cycloalkyl, aryl or aralkyl, each aryl or aralkyl being optionally further substituted with one or more C₁₋₄-alkyl groups and/or halogen atoms,

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which process comprises the asymmetric hydrogenation of compounds of formula

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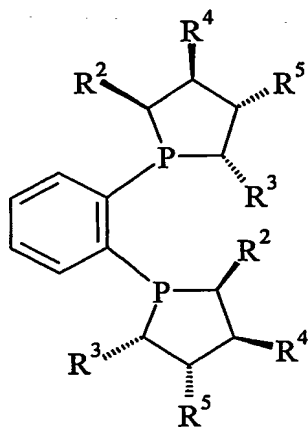
wherein X and R are as defined above,

in the presence of a transition metal complex of a chiral bidentate phosphine ligand and, optionally, a base.

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2. The process of claim 1 wherein the chiral bidentate phosphine ligand is a compound of formula

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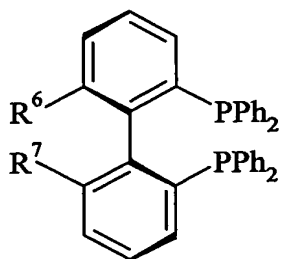


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and enantiomers

wherein R^2 and R^3 are methyl, ethyl or isopropyl; and wherein R^4 and R^5 are hydrogen or R^4 and R^5 together form an isopropylidenedioxy group.

3. The process of claim 1, wherein the chiral bidentate phosphine ligand is a compound of formula



IV,

and enantiomers

wherein R^6 and R^7 are methoxy or ethoxy or wherein R^6 and R^7 together form a 1,3-propylidenedioxy or a 1,4-butyldenedioxy group.

4. The process of claim 1, wherein the chiral bidentate phosphine ligand is selected from the group consisting of (*S,S*)-Me-DuPhos, (*S,S*)-Et-DuPhos, (*S,S,S,S*)-Me-KetalPhos and (*S*)-C4-TunaPhos.

5. The process of any one of claims 1 to 4, wherein the transition metal is Ru or Rh.

6. The process of any one of claims 1 to 5, wherein the transition metal complex of a chiral bidentate phosphine ligand comprises at least one diene, alkene or arene as stabilizing ligand.

7. The process of claim 6, wherein the transition metal complex of a chiral bidentate phosphine ligand comprises at least one stabilizing ligand selected from the group consisting of 1,5-cyclooctadiene and *p*-cymene.

8. The process of any one of claims 1 to 7, wherein the counterion of the transition metal complex of a chiral bidentate phosphine ligand is selected from the group consisting of Cl^- , BF_4^- , AsF_6^- , SbF_6^- and triflate.

9. The process of any one of claims 1 to 8, wherein the catalyst is prepared by mixing a transition metal complex of the formula $[\text{Rh}(\text{cod})_2]^+\text{BF}_4^-$ with a chiral bidentate phosphine selected from the group consisting of (*S,S*)-Me-DuPhos, (*S,S*)-Et-DuPhos and (*S,S,S,S*)-Me-KetalPhos.

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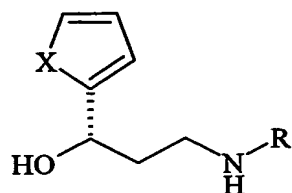
10. The process of any one of claims 1 to 9, wherein the base is a hydroxide, methanolate or ethanolate of lithium, sodium or potassium or a mixture of said bases.

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11. The process of any of claims 1 to 10, wherein the hydrogen pressure during the reaction is in the range of 1 to 60 bar and more particularly preferred in the range of 10 to 30 bar.

12. Compounds of formula

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I

and enantiomers

and its addition salts of proton acids, wherein X represents S or O, and R represent C₁₋₆-alkyl, C₃₋₈-cycloalkyl or benzyl with the exception of compounds wherein X is S and R is methyl.

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